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EXAMINER	
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ART UNIT	**PAPER NUMBER**
2644	14

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/446,738	COHEN ET AL.	
	Examiner	Art Unit	
	Andrew Graham	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,9,11,15 and 22-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,9,11,15 and 22-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 December 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The substitute page, page 5, of the specification is acknowledged and has been entered into the case. The previous relevant objection is hereby withdrawn.

Drawings

2. The drawings are objected to because they fail to meet the following requirement(s) of PCT Rule 11.13, see MPEP 1825. This section specifically states, "The examiner may require new drawings where the drawings which were accepted during the international phase did not comply with PCT Rule 11". Certain parts of the drawings are not executed in durable, black, sufficiently dense and dark, uniformly thick and well-defined, lines and strokes. Specifically, in Figures 1, 2A, 2B, 3A, 3B, 4A, 4B, 5, 10A, and 10B, several of the shadings, sound pattern drawings, and the dashed speakers in the drawings are not adequately defined. The applicant is simply requested to re-submit these drawings with the same figures already presented, but wherein the quality of the lines and shading has been improved.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Response to Arguments

3. Applicant's arguments with respect to pending claims 1, 9, 11, 15, and 22-24 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. **Claim 24** is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 24 states that the system further comprises an audio processor that receives audio signals and modulates them with an ultrasound carrier. The modulated ultrasound carrier is then transmitted to the headphone assembly. The next limitation states that this same processor, "said processor", measures the distance between the right and left ears of a user and modifies the signal accordingly. However, the specification does not support this latter ability. The processor that modulates signals to

be transmitted is not described as being able to both modulate the audio, transmit it, and also remotely measure the head of the user. Rather, the specification appears to support the use of a separate processor in the headphone assembly. Appropriate clarification or amendment is required.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Claims 11 and 15** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 11 recites the limitation "the headphone assembly" in the third line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 11 includes the limitation "the left ear provides a rear right signal to the right ear". It appears that the first element in this limitation should instead be "the left receiver".

Claim 15 recites the limitation "said system" in the fifteenth line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. **Claims 1, 9, and 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Neumann et al (DE 2652101 A1) in view of Fidi (USPN 5033086). Hereafter, "Neumann et al" will simply be referred to as "Neumann".

Neumann discloses a device for the wireless transmission of sound to a pair of headphones that includes the ability of adjustably locating a sound source at a perceived imaginary position. The sound is transmitted in a wireless manner to the headphones by being modulated onto a carrier (page 4, lines 1-4). The overall device reads on "a wireless headphone assembly". As can be seen in Diagram 2, the headphones (15,16) include ultrasound reception elements (6,7) (page 5, lines 5-10). As is also shown in Diagram 2, the transmitters (19,20) receive different channels of a modulated stereo signal (page 6, lines 1-6). Thus, the reception of the signal by reception elements (6,7) reads on "at least two ultrasound receivers for receiving at least two ultrasound signals along at least two ultrasound channels". The ultrasound signal is processed by the demodulators (10,11) and then passed through amplifiers (13,14) before

being received by the headphone systems (15,16)(page 5, lines 13-22). The headphone systems (15,16) read on "at least two transducers for converting each of said ultrasound signals of said ultrasound channels to human audible signals, each of said two transducers being located on an earpiece". The respective receiving elements, in regards to their positionings and corresponding signal processing paths, read on "called a right receiver and a left receiver".

Neumann does not specify:

- that ultrasound signals are provided through front and rear channels to the right and left ears of a user
- that the transmission system receives and provides a front left and right rear signal to the left ear of a user from a left receiver
- that the transmission system receives and provides a front right and left rear signal to the right ear of a user from a right receiver

Fidi discloses a sound processing system that improves the localization of sound signals received through headsets (col. 5, lines 37-45). Fidi improves this localization by applying transfer functions and delays to the input signals for each channel. As shown in Figure 4, each ear of a user receives signals from the corresponding input channel, along with two signals from the opposite channel that are delayed (T_2, T_3, $T_{2'}$, $T_{3'}$) and processed by transfer functions respective to particular directions (col. 5, lines 46-68 and col. 6, lines 1-8). The directional associations for the applied

transfer functions are shown to include the directions of the left rear direction derived from the received right channel signal and the right rear signal derived from the received left channel signal. These signal processing paths, in view of the signal reception and processing scheme of Neumann, reads on "provide ultrasound signals through front and rear channels to the right and left ears of a user". The same and opposite channel reception of audio signals at the ears of the user reads on "the right receiver provides a front right signal to the right ear and the left receiver provides a front left signal to the left ear, and wherein the right receiver provides a rear left signal to the left ear and the left receiver provides a rear right signal to the right ear". The delays to signals from the opposite input channel, which Fidi states may be adjusted and unevenly applied, read on "wherein said rear channel is accompanied by a delay operative to simulate an acoustic delay occurring between the arrival of sound from a signal source at both ears of the user".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to implement the signal dividing and processing system of Fidi into the headset system of Neumann. The motivation behind such a modification would have been that the additional, selectively delayed and filtered signals of Fidi would have, as taught by Fidi, provided true auditive originality and enhanced the localization of the audio signals of a particular sound field emitted for a user of the headset of Neumann.

Regarding **Claim 22**, please refer to the like teachings of Claim 1 regarding the relative limitations of the first thirteen lines of the claim. The transmitting stage of the system of Neumann includes a two stereo sound entrances (21,22) which connect input signals to modulators (19,20) that modulate the sound signals with a carrier frequency from a joint carrier frequency generator (4) (page 6, lines 1-7). Collectively, these signal inputs (21,22) and modulators (19,20) and carrier frequency generator (4) read on "at least one processor receiving a multi-source signal and modulating an ultrasound carrier along a plurality of channels". The output of this system are emitted by two transmitters, which reads on "at least one transmitter for transmitting said modulated ultrasound carrier to the at least one headphone assembly along said plurality of channels". As an option for the stereo embodiment, Neumann also notes that the different stereo channels can be modulated with different carrier frequencies so that their outputs do not overlap (page 6, lines 9-11).

Regarding **Claim 9**, the perceived phase difference in the system of Neumann between the received channel signals in each ear enables the user to hear imaginary sound source directions (page 6, lines 13-15). Neumann also notes that a user may concentrate on a sound source, and that plural sound sources may be in the recording area (page 3, lines 10-18). This reads on the system being "operative to cause a listener using said headphone assembly to experience psycho-acoustic effects that said listener would experience if the multi-source signal were transmitted in free space as audible sound waves

from suitably located sound sources". The parallel between the system and normal, spatially positioned speakers is discussed on page 4, lines 18-30.

4. **Claims 11, 15, and 23** are rejected under U.S.C. 103 (a) as being unpatentable over Neumann in view of Fidi as detailed above, and in further view of Inanaga et al (EP 438 281). Hereafter "Inanaga et al" will simply be referred to as "Inanaga".

As detailed above, Neumann discloses a device for the wireless transmission of sound to a pair of headphones that includes the ability of adjustably locating a sound source at a perceived imaginary position. In the system of Neumann, the phase difference between left and right signals is obtained only through the reception of both signals from the stereo signal transmitters (page 6, lines 11-15). The overall sound reproduction approach of the system of Neumann reads on "A method for simulating an artificial sound environment". The output of audio signals through the two speakers (15,16) in Diagrams 1 and 2 reads on "said headphone assembly audibly providing at least one audio signal to each of the ears" and "sending at least two audio signals via said headphone assembly to each of the ears". Fidi discloses the use of the input channels to provide additional localization cues to opposite sides of a user's listening position. As explained in further detail in Claim 1, the processing scheme of Fidi reads on the right receiver providing "a front right signal to the right ear" and "a rear left signal to the left ear". The

processing also reads on the left receiver of Neumann providing "a front left signal to the left ear" and "a rear right signal to the right ear".

Neumann in view of Fidi does not specify:

- the sending of an ultrasonic reference signal to the headphone assembly
- processing the arrival times of the reference signal at each ear so as to measure a phase difference and a distance between the two ears of the user
- modulating at least two audio signals in accordance with the difference

Inanaga discloses a method for the imaginary placement of an audio signal source that includes the sending of an ultrasonic reference signal. The scheme of Inanaga includes the emission of an ultrasonic reference signal which is received by receivers on a user headset, which reads on "sending an ultrasound reference signal to the headphone assembly worn by a user having two ears". The circuit of Inanaga includes a transmission characteristic processing circuit (23) for providing the right and left channel acoustic signals (S_R, S_L) to a user's ears(col. 7, lines 12-21). This processing and signal transfer also reads on "said headphone assembly audibly providing at least one audio signal to each of the ears". The detection times of the ultrasonic reference signal from each of the adjustable left and right receivers (5L,5R) are provided to a time difference detection circuit

(19) and a distance calculating circuit (18), the output of the latter of which is involved with the ability to calculate the size of a user's head (col. 5, lines 54-58 and col. 6, lines 1-38). The radius of the user's head is specifically involved with the calculations performed by the angle calculating circuit (20) (col. 6, lines 39-43). This reads on "processing arrival times of said ultrasound reference signal at each said ear, so as to measure a phase difference of said signal as perceived by one ear in contrast to the other ear and to measure a distance between the two ears of the user". The time difference and distance detections are provided to an angle calculating circuit (20), the output of which is used in adjusting signal processing units (21L, 21R) which receive adjusted versions of the left and right input signals as respective inputs. This reads on "modulating at least two audio signals, at least one for each ear, in accordance with said phase difference". Again, the outputs of these processing units (21L,21R) are provided to be reproduced by the headphones, which reads on "sending said at least two audio signals via said headphone assembly to each of the ears" (col. 8, lines 49-56). The audio processing circuits of Inanaga also include delay circuits (26,27) for variably adjusting the delay of the cross talk components of input channel signals based on the size of the head of the user (col. 8, lines 31-37).

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to implement the ultrasonic signal processing and transfer characteristic modulating circuitry of

Inanaga into the headphone signal processing system of Neumann in view of Fidi. The motivation behind such a modification would have been that the circuitry of Inanaga would have actively adjusted the signal according to the head orientation of the user as opposed to the passive approach of the system of Neumann. This active adjustment circuitry would have enabled a user or device producer to have a more active control in the effect imparted upon the audio system by the orientation and reproduction circuitry. The sensors of Inanaga are also adjustable, a feature that would have enabled particular user specific influence to the reproduced sound, which is not addressed by Neumann in view of Fidi.

Regarding **Claim 15**, please refer to the like teachings of Claims 1, 11, and 22, noting the function of the orientation based adjustments made in the system of Inanaga.

Regarding **Claim 23**, please refer to the like teachings of claims 1, 9, and 11, again noting the orientation based adjustments made in the system of Inanaga.

5. **Claim 24** is rejected under 35 U.S.C. 103(a) as being unpatentable over Neumann in view of Fidi and Inanaga as applied above, and in further view of Wood et al (USPN 6009179). Hereafter, "Wood et al" will simply be referred to as "Wood".

Neumann discloses a device for the wireless transmission of sound to a pair of headphones that includes the ability of adjustably locating a sound source at a perceived imaginary position. The sound

is transmitted in a wireless manner to the headphones by being modulated onto a carrier (page 4, lines 1-4). Neumann notes that a user may concentrate on a sound source, and that plural sound sources may be in the recording area (page 3, lines 10-18). The general, overall system reads on "A headphone assembly providing a simulated, multi-sound source environment". As can be seen in Diagram 2, the headphone includes headphone systems (15,16) along with ultrasound reception elements (6,7) (page 5, lines 5-10). As is also shown in Diagram 2, the transmitters (19,20) receive different channels of a modulated stereo signal (page 6, lines 1-6). The reception of the signal by reception elements (6,7) in the headphone reads on "at least one headphone assembly having right and left earpieces, said headphone assembly including at least two ultrasound receivers for receiving at least two ultrasound signals along at least two ultrasound channels". The ultrasound signal is processed by the demodulators (10,11) and then passed through amplifiers (13,14) before being received by the headphone systems (page 5, lines 13-22). The headphone systems (15,16) read on "at least two transducers for converting each of said ultrasound signals of said ultrasound channels to human audible signals, each of said two transducers being located on an earpiece". The transmitting stage of the system includes a two stereo sound entrances (21,22) which connect input signals to modulators (19,20) that modulate the sound signals with a carrier frequency from a joint carrier frequency generator (4) (page 6, lines 1-7). Collectively, these signal inputs (21,22) and modulators (19,20) and carrier

frequency generator (4) read on "at least one processor receiving audio signals and modulating an ultrasound carrier along a plurality of channels". The output of this system are emitted by two transmitters, which reads on "at least one transmitter for transmitting said modulated ultrasound carrier to said headphone assembly along said plurality of channels". The reception elements are specifically noted as being interposed in front of each of the listener's ears (page 4, lines 26-29). These reception elements also then read on "a right receiver which is located adjacent to the right earpiece and a left receiver which is located adjacent to the left earpiece". As an option for the stereo embodiment, Neumann also notes that the different stereo channels can be modulated with different carrier frequencies so that their outputs do not overlap (page 6, lines 9-11).

As discussed above, the teachings of Fidi involve the application of modified versions of input channels to the opposite hearing paths of the input channels. The processing arrangement of Fidi, which imparts a directional transfer function upon select signals, reads on "the right and left receivers providing ultrasound signals through front and rear channels to the right and left ears of the user". The opposite channel signal lines each include delay elements, which reads on "a relative delay is introduced between the left and right signals, so as to also produce a virtual speaker effect".

As also discussed above, Inanaga discloses the emission of an ultrasonic reference signal that is received by receivers on a user

headset. The circuit of Inanaga includes a transmission characteristic processing circuit (23) for providing the right and left channel acoustic signals (S_R,S_L) to a user's ears (col. 7, lines 12-21). The detection times of the ultrasonic reference signal from each of the adjustable left and right receivers (5L,5R) are provided to a time difference detection circuit (19) and a distance calculating circuit (18), the output of the latter of which is involved with the ability to calculate the size of a user's head (col. 5, lines 54-58 and col. 6, lines 1-38). The radius of the user's head is specifically involved with the calculations performed by the angle calculating circuit (col. 6, lines 39-43). The time difference and distance detections are provided to an angle calculating circuit (20), the output of which is used in adjusting signal processing units (21L, 21R) which receive adjusted versions of the left and right input signals as respective inputs. This circuitry involved with executing this function reads on "said processor measures the distance between right and left ears of a user and modifies the audio input to each of the ears of the user according to the measured distance". The audio processing circuits of Inanaga also include delay circuits (26,27) for variably adjusting the delay of the cross talk components of input channel signals based on the size of the head of the user (col. 8, lines 31-37).

However, Neumann in view of Fidi and Inanaga do not specify:

- that the left ultrasound receiver provides front left, front right, and center signals to the left ear

- that the right ultrasound receiver provides front left, front right, and center signals to the right ear
- that the left ultrasound receiver provides rear left and rear right signals to the right ear
- that the right ultrasound receiver provides rear left and right signals to the left ear

Wood discloses a method for providing multi-channel surround sound effects through a two channel headset system. Figure 5 illustrates a eight channel embodiment, wherein different channels are applied to transfer functions, delays, amplifiers, and phase disturbances (col. 8, lines 39-50). Summers (530,535) combine original or modified versions of each of these input channels into two separate left and right channels (LT,RT). This combination of signals, in view of the reception scheme of Neumann and the opposite channel processing of Fidi, reads on "the left ultrasound receiver provides front left, front right, and centre signals to the left ear" and "rear left and rear right signals to the right ear". The signal combination of Wood in view of the teachings of the other above references also reads on "the right ultrasound receiver provides front left, front right, and centre signals to the right ear" and "rear left and rear right signals to the left ear". Figure 5 also illustrates that, before a signal from a left or right channel is applied to the opposite summation channel, it is delayed. Delay elements (540, 555, 320, 335) can be seen for each of the left, right, left surround, and

right surround channels respectively (col. 7, lines 57-65 and col. 8, lines 5-11 and 39-50). This application of delays reads on "the front right signal provided to the left ear is delayed with respect to the front right signal provided to the right ear; the front left signal provided to the right ear is delayed with respect to the front left signal provided to the left ear; the rear right signal provided to the left ear is delayed with respect to the rear right signal provided to the right ear; the rear left signal provided to the right ear is delayed with respect to the rear left signal provided to the left ear". This collective set of delays also reads on "thereby a relative delay is introduced between left and right signals, so as to also produce a virtual speaker effect with respect to said user".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the multi-channel conversion system of Wood into the two channel stereo input of the system of Neumann in the combination of the references of Neumann in view of Fidi and Inanaga. The motivation behind such a modification would have been that the additional system would have provided a method of incorporating each channel of a multi-channel input into the two output channels of the system Neumann in view of Fidi and Inanaga. This would have improved the range of possible audio input sources for the collective system. The teachings of Wood also involve several surround sound enhancing features specifically for headset systems, such as head related transfer function circuits and delays, that would

have promoted the surround sound realism found in multi-speaker, non-headset based audio systems.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is 703-308-6729. The examiner can normally be reached Monday-Friday, 8:30 AM until 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Isen can be reached on (703)305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andrew Graham
A.U. 2644
March 1, 2004

MINSUN OH HARVEY
PRIMARY EXAMINER